KSU/CCIS/CS CSC 524 Final Exam - 2nd term 2009/2010

Wed. 23/06/2010 (3 hours)

Answer the questions Q1 to Q5 in one sheet, and the questions Q6 to Q9 in another sheet. Question Q9 is a bonus question.

Q 1. **(2+4+4 = 10 Marks)** A station S_1 sends n frames to S_2. No acknowledgement is sent before the n^{th} frame is received, and the window size is greater than n. Determine the differences between the number of exchanged frames if selective repeat is used or if Go-Back-N is used in the following cases:

(a) no error happens

(b) an error occurs during the transmission of the p^{th} frame ($1 \leq p \leq n$).

(c) an error occurs during the transmission of both the p^{th} frame and the q^{th} frame ($1 \leq p < q \leq n$).

Q 2. **(10 Marks)** Two stations S_1 and S_2 exchange frames. Each one has three frames to send to the other party. S_1 starts by sending its first frame, then S_2 sends its first frame before it receives any frame from S_1. Stop-and-Wait with piggybacking is used. Give the timeline of the frames exchange.

Q 3. **(5+5 = 10 Marks)** Three CSMA protocols were presented during the lectures (1-persistent CSMA, non-persistent CSMA, and p-persistent CSMA).

(a) What are the differences between them?

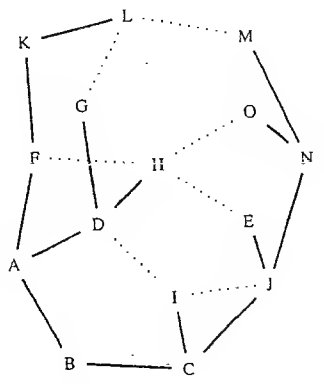
(b) What improvements does each one of them provide and how?

Q 4. **(10 Marks)** Distance Vector Routing is used for this question. A node N_0 receives the following information from its neighbors:

from N_1:	5	0	7	4	10	3	9
from N_2:	2	6	0	8	1	12	3
from N_4:	8	9	6	9	0	3	11

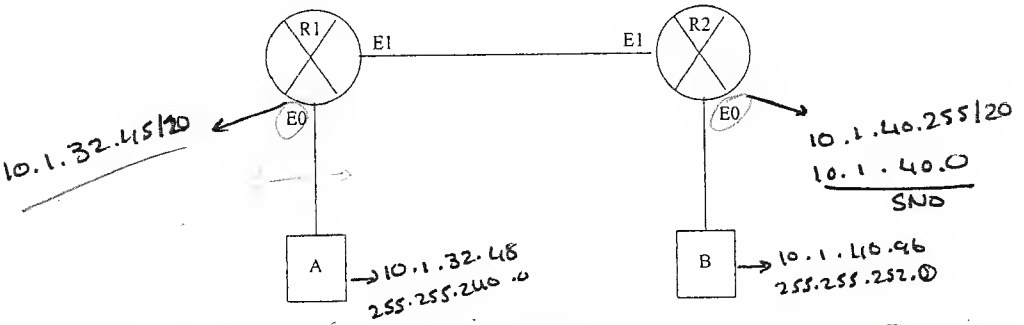
The delays from N_0 to its neighbors N_1, N_2, and N_4 are respectively 5, 4, and 7. Give the new routing table for N_0.

Q 5. **(10 Marks)** Consider the following subnet where the sink tree for B is represented by bold continuous lines.



There is some problem with this design. Figure out the problem and how you will rectify this issue to make an accurate design of this network.

(b) Consider the following figure:



There are two routers, R1 and R2. Router R1 is connected with host A through interface E0 and router R2 is connected with host B through its interface E0, whereas, router R1 and R2 are directly connected with each other through their interfaces E1.

The configuration of the network is as follow:

Router R1: E0:IP address: 10.1.32.45/20

Router R2: E0:IP address: 10.1.40.255/20

PC A: IP address: 10.1.32.48, Subnet Mask: 255.255.240.0, Gateway: 10.1.32.45

PC B: IP address: 10.1.40.96, Subnet Mask: 255.255.252.0, Gateway: 10.1.40.255

When host A tries to communicate with host B, he does not receive packets from host B. What is the problem in this network and how you will correct this?

(c) If mask 255.255.255.128 were used with a Class B network, how many subnets could exist, with how many hosts per subnet, respectively.

(d) A Class B network needs to be subnetted such that it supports 100 subnets and 100 hosts per subnet. For this requirement, if multiple masks meet those requirements, the engineer should choose the mask that maximizes the number of hosts per subnet. Which mask the engineer will use.

Q 9. BONUS (5+5 = 10 Marks)

(a) You are the network engineer and you have been assigned the network ID: 192.168.1.0 and you have to design the network in such a way that you must be able to create at least 8 subnets. What subnet mask you will use for this design. Also write down the subnet numbers for first three subnets. Then write down the first and last valid address within second subnet.

(b) Which of the following are valid subnet numbers in network 180.1.0.0, when using mask 255.255.248.0?

(1) 180.1.2.0
(2) 180.1.4.0
(3) 180.1.8.0
(4) 180.1.16.0
(5) 180.1.32.0
(6) 180.1.40.0

Node B broadcasts a packet to all the other nodes. Give the exchanged packets if reverse path forwarding is used.

Q 6. (5+5 = 10 Marks)

(a) Briefly explain the similarities and differences between OSI and TCP/IP models

(b) Briefly explain the differences between leased line and Frame Relay.

Q 7. (7+7+6 = 20 Marks)

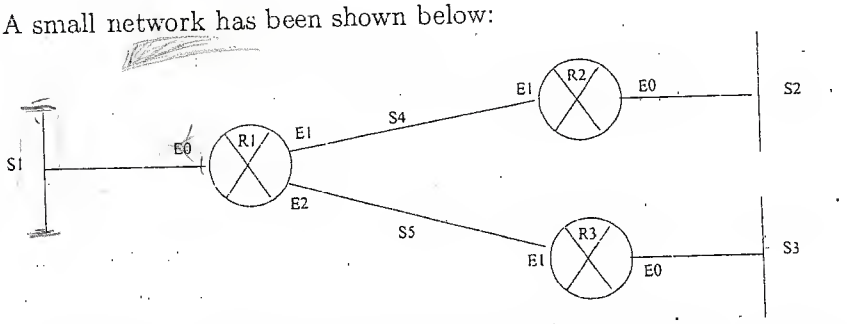
(a) Briefly explain Static NAT and Dynamic NAT. What is NAT overloading and what is the difference between NAT overloading and PAT? Briefly explain the terms inside global, outside global, inside local and outside local. Support your answer through an example.

(b) Define Quality of Service (QoS). Briefly explain, Priority Queueing, Round Robin and Low-latency Queueing. If you are the network provider, which Queueing scheme you would like to implement in your network to provide an efficient service to the customer.

(c) Briefly explain the difference between IntServ, DiffServ and MPLS.

Q 8. (8+6+3+3 = 20 Marks)

(a) A small network has been shown below:



In the above network, there are five subnets: S1,S2,S3,S4, and S5. The network Id is 172.16.0.0.

R1 is having three interfaces, E0, E1 and E2 in such a way that E0 is connected with subnet 1, E1 is connected with router R2 (this connection is subnet 4) and E2 is connected with router R3 (this connection is subnet 5).

Router R2 is having two interfaces, E0 and E1, E0 is connected with subnet 2 and E1 is directly connected with R1 called as subnet 4.

Router R3 is also having two interfaces, E0 and E1, E0 is connected with subnet 3 and E1 is directly connected with router R1 called as subnet 5.

Using VLSM, the network has been designed and the subnet numbers along with their prefixes have been given as follow:

Subnet 1: 172.16.2.0/23
Subnet 2: 172.16.4.0/23
Subnet 3: 172.16.5.0/24
Subnet 4: 172.16.9.0/30
Subnet 5: 172.16.9.4/30